AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

Claims 1 – 13 (Cancelled)

14. (Previously presented): In a data processing system including a display device and a processing means running an application program, the application program having a user interface with a plurality of User Interface Output States (UIOSes) and a plurality of operators, each operator for transforming a currently displayed UIOS to a displayed next UIOS, a method comprising the steps of:

providing a user interface output system for controlling the generation of a user interface output sequence;

providing a specification identifying a plurality of goal UIOSes for the user interface output system to establish and identifying the plurality of operators, each of the operators having at least one precondition to be satisfied before the operator can be performed;

providing a compiler for compiling the specification which results in a user interface output controller distinct from the application program, the user interface output controller including a plurality of plans, each of the plans having a series of operators, a start UIOS and one of the goal UIOSes, the series of operators for transforming the start UIOS to at least one intermediate UIOS to the goal UIOS, the operators in the series such that the preconditions of each of the other operators in the series are satisfied after performance of earlier operators in the series; and

while the application program is running on the processing means,

providing the user interface output controller with an event received from the application program, the event identifying one of the goal UIOSes;

determining a currently displayed UIOS;

retrieving one of the plurality of plans such that the start UIOS ~~TAOS~~ of the retrieved plan is the currently displayed UIOS and the goal UIOS of the retrieved plan is the goal UIOS identified by the event; and

performing the series of operators provided by the retrieved plan to display the start UIOS followed by the at least one intermediate UIOS followed by the goal UIOS.

15. (Original): The method of claim 14 wherein the step of providing a specification includes the steps of:

providing events which may be specified by the application program and for which the user interface output system provides user interface output sequences;

providing state variables that define attributes of each user interface outputstate; and

providing operators that identify actions which are used to modify the attributes of each user interface output state.

16. (Original): The method of claim 15 wherein the specification includes timing directives which determine the time at which an action is perfonned.

17. (Original): The method of claim 15 further comprising providing state class definitions which are hierarchical groupings of state variables.

18. (Original): The method of claim 15 further comprising providing autonomous action sequences identifying actions which are performed by the user interface output system when a current user interface output state contains predefined values for conditions which capture attributes of the current user interface output state.

19. (Original): The method of claim 14 wherein the step of compiling the specification applies a planning methodology to generate each of the plans.

20. (Previously presented): The method of claim 19 wherein the step of applying a planning methodology to generate each of the plans includes the steps of

selecting each of the plurality of goal UIOSes;

for each selected goal UIOS, selecting each of the plurality of operators:

performing an inverse of the selected operator on the selected goal UIOS; and

when the operators transforms the selected goal UIOS into a new UIOS, storing the new UIOS along with the selected operator.

21. (Previously presented): The method of claim 20 wherein the new UIOS is identified as an intermediate UIOS and is then processed as a goal UIOS.

22. (Currently amended): In a data processing system including a display device and a processing means running an application program, a method comprising the steps of:

providing a compiled user interface output controller for generating a user interface output sequence, the user interface output controller distinct from the application program, the user interface output sequence including a first user interface output state (UIOS) and a second user interface output state, the first user interface output state and the second user interface output state each including a set of conditions representing values which capture attributes of that user interface output state; and

under the control of the user interface output controller,

receiving operators from the application program each operator having a precondition consisting of one of the conditions in the set and a required value for the condition such that the operator can only be performed when a current user interface output state satisfies the precondition by including the condition representing the required value;

after receiving the operators, receiving an event from the application program specifying a goal to be achieved by the user interface output sequence;

upon receiving the event from the application program, determining conditions which temporally precede the event;

establishing the determined conditions which precede the event;

performing a plurality of the received operators to transform the first user interface output state into the second user interface output state, which establishes the event, the plurality such that a first operator of the plurality has a precondition which is satisfied by a current user interface output state and wherein after the performance of each operator in the plurality resulting UIOS ~~UTOS~~ satisfies the precondition for the operator next in the plurality;

determining conditions which temporally follow the event,

and

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establishing the determined conditions which follow the event.

Claims 23 – 25 (Cancelled)

26. (Previously presented): A data processing system, comprising:

a display device for displaying a sequence of a plurality of user interface output states (UIOSes);

a processing means for running an application program;

means for providing a user interface output system for controlling the generation of the sequence;

means for providing a specification identifying goal UIOSes for the user interface output system to establish and identifying a plurality of operators, each operator for transforming one UIOS into another UIOS such that a precondition of the operator is established by the one UIOS and such that a postcondition of the operator is established in another UIOS:

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means for compiling the specification to generate a user interface output controller distinct from the application program; and

means for storing the user interface output controller in memory, the user interface output controller including,

means for receiving an event from the application program, the event identifying one of the goal UIOSes

means for determining a current UIOS ~~ULOS~~ in the sequence;

means for determining a series of operators which transform the determined current UIOS into the identified one of the goal UIOS and

means for performing the series of operators to display the sequence on the display device, the performing to transform the determined current UIOS into at least one intermediate UIOS ~~ULOS~~ and then into the identified one of the goal UIOSes.

27. (Previously presented): The system of claim 26 wherein the received event identifies a timing specification which determines the time at which the series of operators are performed.

28. (Previously presented): The system of claim 27 further comprising means for incorporating the identified timing specification into the sequence.

29. (Previously presented): A user interface output system for controlling the generation of a user interface output sequence, comprising:

a specification for identifying goal user interface output states, which identify user interface output states for the user interface output system to establish and for identifying operators which specify actions to be performed by the user interface output sequence each of the operators having at least one precondition to be satisfied before the operator can be executed;

a compiler for compiling the specification to generate a user interface output controller distinct from an application program; and

E4 a storage for storing the user interface output controller in memory, the user interface output controller comprising,

a receiver for receiving an event from the application program, the event identifying one of the goal user interface output states;

a first determinor for determining a current user interface output state in the user interface output sequence;

a second determinor for determining a sequence of operators which transform the determined current user interface output state into at least one intermediate user interface output state and then into the identified one of the goal user interface output states, the operators in the sequence such that after execution of each of the operators in the sequence other than a last operator, the preconditions of a next operator in the sequence are satisfied; and

an executor for executing the sequence of operators to transform the determined current user interface output state into the at least one intermediate user interface output state and then into the identified one of the goal user interface output states so as to display the sequence of operators on a display device.

E5 30. (Original): The system of claim 29 wherein the received event identifies a timing specification which determines the time at which the sequence of operators are performed.

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31. (Original): The system of claim 30 further comprising a timer for determining the time at which the sequence of operators are performed.

32. (Currently amended): A computer-readable storage medium, upon which is stored a compiled user interface output controller for generating a user interface output sequence, the user interface output controller distinct from an application program and performing the steps of:

receiving an event from the application program, the event specifying a goal to be achieved by the user interface output sequence by displaying a series of a plurality of user interface output states; and

upon receiving the event from the application program,

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generating the user interface output sequence ~~, wherein the user interface output sequence achieves~~] for achieving the goal user interface output sequence including: a plurality of operators that if executed when a predefined set of conditions are true will display the plurality of user interface output states, the predefined set of conditions including at least one precondition of a first of the plurality of operators such that at least one precondition must be true before the first operator can be executed, the operators in the sequence ordered such that execution of previous operators in the sequence will establish as true conditions necessary for execution of a next operator in the sequence ÷ ; and

executing the plurality of operators of the generated user interface output sequence when the predefined set of conditions is true so as to display the series of the plurality of user interface output states on a display device.

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33. (Currently amended): In a data processing system including a display device and a processing means running an application program, the application program having a user interface with a current User Interface Output State (UIOS) displayed on the display device, a method comprising:

providing a compiled user interface output controller for displaying the user interface, the user interface output controller distinct from the application program;

under control of the application program,

without knowledge of the current UIOS displayed on the display device, determining a goal UIOS to be displayed on the display device; and

sending to the user interface output controller an indication of the goal UIOS; and

under control of the user interface output controller,

receiving from the application program the indication of the goal UIOS;

determining the current UIOS;

determining a sequence of a plurality of operators based on the determined current UIOS and the goal UIOS; and

for each of the operators in sequence, performing the operator to transition the user interface from the a current UIOS to a different resulting UIOS, the performing such that the resulting UIOS is displayed on the display device and becomes the current UIOS ~~UTOS~~ and such that the current UIOS after all the operators are performed is the goal UIOS, the sequence such that the preconditions for a first operator in the sequence are currently established and such that the preconditions for all other operators in the sequence are established after execution of earlier operators in the sequence,

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whereby the application program specifies the a goal UIOS without knowledge of the current UIOS, and in response the user interface output controller determines a sequence of operators that when performed transition the user interface from the current UIOS through at least one displayed intermediate UIOS to the displayed goal UIOS.

34. (Previously presented): The method of claim 33 wherein the determined sequence of the plurality of operators is generated after the receiving of the indication of the goal UIOS.

35. (Previously presented): The method of claim 33 wherein each UIOS has a value for each of a plurality of UIOS variables, wherein each operator has a precondition of a UIOS variable and a required value for the UIOS variable, wherein an operator having a precondition of a first variable and a first value can only be performed when the a current UIOS satisfies the operator precondition by having a value for the first variable that is equal to the first value, wherein the determined sequence begins with a first operator whose precondition is satisfied by the determined current UIOS, and wherein alter the performance of each operator in the determined

sequence, the resulting UIOS satisfies the precondition for the operator next in ~~in~~ the determined sequence.

36. (Previously presented): The method of claim 35 wherein the determined sequence is generated by:

identifying the ~~a~~ UIOS variable whose value in the goal UIOS is different than in the current UIOS;

selecting a last operator such that the resulting UIOS from performing the last operator has a value for the identified UIOS variable that is equal to the value for the identified UIOS variable in the goal UIOS;

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selecting an initial operator such that the resulting UIOS from performing the initial operator satisfies the precondition of the last operator;

until the current UIOS satisfies the precondition of the initial operator, repeatedly performing the steps of

designating the initial operator to be an intermediary operator; and

selecting an initial operator such that the resulting UIOS from performing the initial operator satisfies the precondition of the operator most recently designated to be the ~~an~~ intermediary operator;

determining the plurality of operators to be the selected operators; and

determining the sequence of the plurality of operators to be a reverse of the selection order.

37. (Currently amended): A method for displaying user interface information for a plurality of application programs, each application program having a distinct user interface and an operator set consisting of a plurality of operators, each operator having at least one precondition which must be established before the operator can be performed, the method comprising:

providing a compiled user interface output controller distinct from the application programs; and

under control of the user interface output controller and for each of the application programs,

receiving from the application program the operator set for the application program;

after receiving the operator set, receiving from the application program a plurality of user interface goals, each user interface goal reflecting information to be displayed in the user interface for the application program; and

for each user interface goal, achieving the user interface goal by

determining the information currently displayed in the user interface for the application program;

after receiving the user interface goal, determining a series of operators from the operator set for the application program that will transition the user interface for the application program from displaying the determined information to displaying the information reflected by the user interface goal, the series such that the preconditions for a fast operator in the series are currently established and such that the preconditions for all other operators in the series are established after execution of earlier operators in the series; and

executing the determined series of operators in sequence such that the information reflected by the user interface goal is displayed when the executing is complete,

whereby an executing user interface output controller can receive a set of operators and a plurality of user interface goals from each of the ~~a~~ plurality of application programs, and can determine for each user interface goal the ~~a~~ series of operators from the operator set for the application program that when executed in sequence will achieve the user interface goal.

38. (New) A system that generates a user interface output controller, comprising:

a compiler that compiles one or more specifications regarding a plurality of goal UIOSes; and

a compiled user interface output controller, generated by the compiler, that is distinct from an application program.

39. (New) The system claim of claim 38, the compiled user interface output controller comprises:

an input component to receive an event from the application program, the event identifies one or more goal user interface output states;

a first determinor that determines a current user interface output state in a user interface output sequence;

a second determinor that determines a sequence of operators which transform the determined current user interface output state into at least one intermediate user interface output state and then into the identified goal user interface output state;

a sequencer that comprises a sequence of operators that after execution of each operator in sequence other than the last operator, the precondition of a next operator in the sequence is satisfied; and

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an executor that executes the sequence of operators to transform the determined current user interface output state into the at least one intermediate user interface output state and then into the identified goal user interface output state so as to display the sequence of operators on a display device.

40. (New) The system of claim 39, the received event identifies a timing specification that determines the time in which the sequence of operators are performed.

41. (New) The system of claim 40, that comprises a timer that determines the time in which the sequence of operators are performed.

42. (New) The system claim of claim 38, that further comprises a storage that stores the compiled user interface output controller in memory.

43. (New) A method for generating a user interface output controller comprising:

retrieving at least one specification identifying at least one goal user interface output state for the user interface output controller to establish, the at least one specification further comprising at least one operator for specifying actions to be performed by the compiled user interface output controller, each operator having least one precondition to be satisfied before the operator can be executed; and

compiling the at least one specification to create a user interface output controller distinct from an application program.

45. (New) The method of claim 43, further comprising identifying a timing specification which determines the time in which the sequence of operators is to be performed.

46. (New) The method of claim 45 further comprising determining the time in which the sequence of operators are performed.

47. (New) The method claim of claim 43, further comprising storing the compiled user interface output controller in memory.

48. (New) A system that generates a user interface output controller, comprising:

means for compiling one or more specifications regarding a plurality of goal UIOSes; and

means for generating a compiled user interface output controller that is distinct from an application program.